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(54) Deodorant composition

(57) A deodorant composition contains zinc glycinate in a cosmetically acceptable vehicl . Cream, aerosol and roll-on compositions are exemplified.

SPECIFICATION

Deodorant compound

The present invention relates to zinc glycinate as a deodorant activ material having the dual function of chemically neutralizing body odours and inhibiting bacterial growth, particularly gram negativ bacteria.

The prior art is replete with antiperspirant compositions containing zinc salts per se or in combination with aluminium and/or zirconium salts, as the active antiperspirant agent. The Journal of the American Pharmaceutical Association, Vol. XLVII, No. 1, Jan. 1958, pages 25—31 discloses combinations of zinc methionate and aluminium sulphamate, and zinc sulphate in combination with aluminium methionate. The Chemistry and Manufacture of Cosmetics by Maison G. de Navarre, 1941, page 261 lists the zinc salts in common use as antiperspirants to include the sulphata, chloride and sulphocarbonate; and further lists other zinc salts worth investigating which include benzoate, citrate, formate, glycerophosphate, perborate, salicylate, zinc-ammonium sulphate and zinc-potassium sulphate. U.S. Patent No. 2,586,289 discloses zinc sulphamate as the antiperspirant in a cream base (oil-water emulsion); and U.S. Patent No. 2,890,987 discloses zinc chloride in a stick form astringent. U.S. Patent No. 3,325,367 discloses zinc sulphamate and zinc phenol sulphonate as antimicrobial astringent metal salts useful in antiperspirant creams, lotions, sticks and powders. U.S. Patent No. 3,856,941 discloses astringent gels containing a mixture of aluminium salts with other metallic salts such as zinc salts including zinc chloride, zinc sulphate and zinc nitrate. U.S. Patents No. 4,045,548 and No. 4,018,887 disclose dry powder antiperspirant agents including zinc sulphate, zinc sulphocarbonate and a zinc-aluminium complex in an aerosol antiperspirant composition. All of the aforesaid zinc compounds function as antiperspirants which restrict the flow of perspiration as a means of combating unpleasant body odours.

The suppression of secretion of perspiration is known to have unfavourable effects on the skin, particularly skin irritation; and may also be corrosive to fabrics in contact therewith. This has led to the use of anticorrosive agents in conjunction with antiperspirants as shown in U.S. Patent No. 2,350,047, wherein a water insoluble metallic anticorrosive agent such as a zinc, magnesium or aluminium oxide, hydroxide or carbonate is added to an antiperspirant composition containing a water soluble astringent salt such as aluminium chloride or sulphate.

The prior art also discloses glycinates such as aluminium zirconium glycinate chelates as antiperspirant agents which restrict the flow of perspiration as noted in U.S. Patents No. 4,049,792, No. 3,792,068 and No. 4,083,956 and British Patent No. 1,572,116. An amino acid, such as glycine, has been added to an antiperspirant composition as an inhibitor of discolouration caused by the aluminium sulphamate antiperspirant, as shown in U.S. Patent No. 2,586,288; and as a protective colloid to inhibit the corrosive action of astringent salts such as aluminium or zinc chloride or sulphate, as shown in U.S. Patent No. 2,236,387.

Another method of combating body odours is the formulation of a deodorant composition containing a deodorant active agent which does not inhibit the flow of perspiration to any appreciable extent. U.S. Patent No. 3,172,817 discloses a water soluble beta diketone zinc salt as an effective deodorant in sanitary napkins, diapers, insoles, creams, soaps, liquids, and body powders. U.S. Patent No. 3,996,346 discloses a deodorant and antiperspirant composition containing zinc oxide and phenol which react in situ to form zinc phenate.

U.S. Patent No. 4,172,123 discloses a deodorant composition containing a zinc salt of an unsaturated hydroxy-carboxylic acid having 17 to 21 carbon atoms, such as zinc ricinoleate as the odour binding agent. The zinc ricinoleate is described as having odour-binding and fungistatic activity.

European Application No. 0-024-176 by Unilever discloses deodorant compositions comprising a suspension of zinc carbonate as the deodorant active material, which reduces axillary body odour without suppressing the secretion of perspiration.

U.K. Patent Application G.B. 2,052,978 A discloses a zinc-glycine combination in solution at a pH of 4.5—8.0 as an anticalculus-antiplaque agent in an oral composition. The zinc salt may be added to the mouthwash as zinc glycinate directly or the zinc salt and the glycine may be added separately. The zinc ions are kept in solution at pH 4.5—8 by using glycine.

However, there is no disclosure of zinc glycinate as a deodorant active material possessing the dual function of inhibiting bacterial growth and chemically neutralizing body odours.

The primary object of the invention is to provide a novel non-irritating, highly effective deodorant compound which neutralizes unpleasant odours through chemical interaction and also inhibits bacterial growth.

The invention also aims to provide deodorant compositions which are substantially non-irritating to the body, containing a zinc glycinate compound as the essential antibacterial active agent.

The invention further aims to provide a deodorant composition containing anhydrous or hydrated zinc glycinate as the essential deodorant agent.

The invention also aims to provide deodorant compositions containing zinc glycinate, which may be in the form of a liquid, cream, gel, solid sticks, powder or spray.

The invention also aims to provide a process for deodorizing odourous body locations by

contacting with a deodorizing amount of a compound which is a zinc glycinate in anhydrous or hydrated form.

According to the present invention a deodorant product comprises a d odorizing amount of zinc glycinate in a non-toxic cosmetically or dermatologically acc ptable vehicle. The vehicle may be a powder such as talcum powder or foot powder; a lotion such as a roll-on composition; a cream base (oil-water emulsion); a gel such as a deodorant stick; or an a rosol or non-a ros l spray.

More specifically, the present invention relates to zinc glycinate as a novel deodorant agent which chemically neutralizes body odours and inhibits bacterial growth, suspended or dissolved in a cosmetically acceptable vehicle; and to a process of deodorizing the human body by contacting said odoriferous locations with said zinc glycinate-containing deodorant compositions.

Zinc glycinate was reported as synthesized by J. V. Dubsky and A. Rabas in Chem. Abstracts Vol. 24, 4722 (1931), by boiling glycine with a zinc oxide solution. The reaction product is described as a zinc metal amino acid complex which exists as the bis (glycino) - zinc (II) monohydrate $(NH_2CH_2COO)_2—Zn \cdot H_2O$.

It has been found that anhydrous zinc glycinate can be obtained by precipitating zinc glycinate from an alcoholic solution and using an excess amount of the glycine reactant to lower the solution pH and permit all the zinc oxide to react. More specifically, glycine and zinc oxide are added to water and the mixture is heated to 93°C and mixed until a clear solution is obtained. Absolute ethanol is then admixed therewith, which precipitates out zinc glycinate, leaving residual glycine in solution. The soft, white, nonhygroscopic crystals are filtered, washed with absolute ethanol, and dred in a vacuum oven or air dried. Analyses of the compound showed it to contain zinc and glycine ratios typical of anhydrous zinc glycinate. Its infrared spectrum resembled that of nickel glycinate. The reaction proceeds according to the following equation:

1. $$ZnO+2(NH_2CH_2COOH)\rightarrow(NH_2CH_2COO)_2Zn+H_2O$$

Analysis	*%*	*Analyzed ratio*	*Theoretical ratio*
Zinc	31.7	32.45	30.62
Glycine	66.0	67.55	69.38
Water	2.5		

The zinc glycinate is an odourless, low density, white, non-hygroscopic crystalline material, insoluble in ethanol and slightly soluble in water, having a solubility of about 6 grams per 100 ml cold water. The pH of a 1% aqueous solution of zinc glycinate is about 8.0 (within the range of 7.9 to 8.7).

It has also been found that zinc glycinate can be prepared by reacting a zinc halide, such as the chloride, with glycine according to the following equation:

2. $$ZnCl_2+2(HOOC—CH_2NH_2)+2\ NaOH\rightarrow Zn(OOC—CH_2NH_2)_2+2NaCl+2H_2O$$

In this method, zinc chloride and glycine are also reacted at elevated temperatures in an aqueous medium until a clear solution is obtained, but the zinc glycinate is precipitated by the addition of sodium hydroxide.

Still another method of producing zinc glycinate has been found, which utilizes the reactants zinc carbonate and glycine, as illustrated by the following equation:

3. $$ZnCo_3+2(HOOC—CH_2NH_2)\rightarrow Zn(OOC—CH_2NH_2)_2+CO_2+H_2O$$

In this method, the zinc carbonate is added to an aqueous solution of glycine. The CO_2 is liberated and the solution is evaporated to dryness or spray dried to obtain white crystals of zinc glycinate. This method does not require the addition of a precipitating agent such as ethanol or sodium hydroxide as in the first two methods explained above, rendering it a more commercially viable method (less costly and more direct).

It has been found that zinc glycinate and deodorant products containing zinc glycinate are highly effective, both for odour prevention as well as for neutralizing existing body odours such as underarm odours, foot odours and the like. In vitro deodorant tests showed that a solution of synthetic sweat odour was completely deodorized by zinc glycinate. In vivo deodorant tests using a 1% aqueous solution of zinc glycinate swabs on armpits with moderate to heavy odour resulted in complete deodorization of the armpits. Deodorant compositions containing zinc glycinate, such as unperfumed roll-on products containing 10% zinc glycinate in suspension, also showed instantaneous deodorizing of existing odours as well as the prevention of odour formation for periods as long as 48 hours.

The deodorant mechanism of zinc glycinate is similar to that of sodium bicarbonate, namely the neutralization of odours through acid/base chemical interaction. However, sodium bicarbonate hydrolyzes to form sodium hydroxide (NaOH), whereas zinc glycinate forms $Zn(OH)_2$, which is a milder base with lower potential skin sensitivity. The deodorant capacity of zinc glycinate (the weight required

to chemically neutralize the odour of x ml of synthetic sweat solution) is about the same as sodium bicarbonate. Zinc glycinate solutions, however, are pH stable, whereas sodium bicarbonate solutions are not, since they release CO_2 and gradually form sodium carbonate, a known skin irritant.

It has additionally been found that zinc glycinate also provides superior antibacterial properties compared to sodium bicarbonate. Using the Halo test and measuring the Zone of Inhibition in mm, using 150×25 mm plastic plates and 12.7 mm disks, the following comparative results were obtain d.

Table 2

	Zone of inhibition	
Organism	*5% Aqueous sodium bicarbonate*	*5% Aqueous zinc glycinate*
Staph. aureus	0	partial inhibition
E. Coli	0	19.5 mm
P. Aeruginosa 10145	0	partial inhibition

Zinc glycinate is effective in aqueous solutions, in suspensions of various types and in powder form. Although zinc glycinate is not an astringent it can be incorporated into practically all antiperspirant type formulations by those familiar with the art. Various deodorant forms include aqueous solutions, alcoholic or cyclomethicone suspensions, pastes, creams, aerosol or non-aerosol sprays and solid sticks which incorporate volatile or non-volatile polar or non-polar vehicles.

Polar non-volatile vehicles may include polyhydric alcohols such as glycerine, propylene glycol, butylene glycol or polyglycols or ethoxylated glycols thereof, or polyethylene glycol.

Non-polar non-volatile vehicles may include emollient oils such as isopropyl myristate, isopropyl palmitate, octyl palmitate, fatty alcohols, fatty amides, ethoxylated or propoxylated fatty alcohols or acids, fatty glycerides or silicone.

Polar volatile vehicles may include water and monohydric alcohols such as ethanol, isopropanol or methanol.

Non-polar volatile vehicles may include hydrocarbons, fluorinated hydrocarbons, and cyclomethicones or mixtures thereof.

Other suitable bases for zinc glycinate are talc, starch, modified starches, oat powder, or other mineral or grain derived powders with particle sizes ranging between 5 and 100 microns which impart a smooth non-gritty feel on the skin.

Deodorant compositions in accordance with this invention will usually comprise about 1 to 20% zinc glycinate in solution or suspension form and may contain upwards of 50% in powder type products.

Certain ingredients to be avoided in zinc glycinate formulations which deactivate its deodorant properties include inorganic or organic acids. Also water soluble metal salts of fatty acids such as sodium stearate will generally react with zinc glycinate in the presence of water to form insoluble zinc stearate.

More specifically, the non-toxic cosmetically or dermatologically acceptable vehicle may be in the form of a lotion which comprises a liquid carrier such as a volatile lower alcohol or an aqueous alcoholic media, preferably ethanol containing a lesser amount of water, having particular utility in a roll-on composition. Usually the liquid carrier also comprises a suspending or thickening agent such as fumed silica, hydroxyethyl cellulose and other cellulose derivatives, hydrophobic clays, and combinations thereof, to maintain the zinc glycinate deodorant powder in suspension. Non-volatile polar or non-polar ingredients may be added to effect the deposition of a dry, non-sticky invisible film on the skin upon evaporation. The said non-volatile agents include polyhydric alcohols such as glycerine, propylene glycol and butylene glycol and polyglycols thereof, and emollient oils such as wheat germ oil, and any other alcohol soluble oils including isopropyl myristate, isopropyl palmitate, other fatty esters, fatty amides, fatty alcohols, fatty ethers such as stearyl ether, ethoxylated fatty alcohols or acids. The amount of emollient present is minor, about 1—5%. Roll-on compositions (dispensed from a roll-on container) in accordance with this invention will usually comprise about 10—20% deodorant active powder, about 0.1—2% suspending agent, about 10—30% non-volatile polar ingredients such as polyhydric alcohols, in a liquid carrier containing about 55—75% monohydric alcohol and 5—25% water.

The vehicle may also be in the form of a cream which usually comprises an emulsion of a fatty material in water. Fatty materials may include fatty esters, cetyl alcohol, ethoxylated fatty alcohols, fatty glycerides, and emollients as list d above. The water content of the cream may constitute about 25—70% of the cream base and with a deodorant active agent content of about 5—15%.

The cream may also be an anhydrous cream comprising a volatile silicone vehicle such as cyclomethicone containing emollients, suspending agents, thickening agents and other suitable ingredients to produce a product of desired consistency.

The zinc glycinate deodorant powder of this invention may also be suspended in a stick bas vehicle which usually comprises a monohydric or polyhydric alcohol or combination thereof gelled with a fatty alcohol or fatty amide. This base may also contain emollients, suspending agents and other non-volatile polar and non-polar ingredients as set forth in the aforedefined roll-on formulations.

Th zinc glycinate deodorant powder may also be susp nded in a liquid vehicl comprising a carrier liquid and a liquified gaseous propellant to formulate an a rosol spray. Additional conventional ingredients as described above may be added, to effect a suitable deodorant spray product.

The vehicle may also be an oil base as in an ointment formulation, wherein the zinc glycinate is intimately admixed with the oil and fatty acid esters.

Another suitable base for the zinc glycinate deodorant is talc as in a talcum powder product.

The amount of the powdered zinc glycinate deodorant present in the deodorant compositions may vary over a wide range and may be as high as 50% by weight, as in ointments or talcum powders. However, about 1—20% is the preferred range in most cosmetic compositions.

The invention may be put into practice in various ways and a number of specific embodiments will be described to illustrate the invention with reference to the accompanying examples.

All amounts of various ingredients are by weight unless otherwise specified.

Preparation of zinc glycinate

Example 1

Components	*Amount*
$ZnCl_2$	13.6 gm
Distilled water	62.9 gm
Glycine	7.5 gm
NaOH (50% soln.)	16.0 gm

13.6 gms of $ZnCl_2$ (1 mole) were dissolved in 62.9 gms of hot distilled water and 7.5 gms of glycine (1 mole) was added to the $ZnCl_2$ solution. A clear solution was obtained. NaOH was added, resulting in the formation of a precipitate which was filtered out of solution, washed with ethanol, and air dried overnight. The precipitate crystals have a pH of 8.0, that of zinc glycinate.

The zinc glycinate crystals were added to a synthetic sweat solution containing the odourous fatty acid components of human sweat, such as acetic acid, and isovaleric acid. The addition of the zinc glycinate caused the pH of the fatty acid solution to rise to 7.0 and the solution was completely deodorized. Zinc glycinate deodorizes within the pH range 8 and 7.

Example 2

Components	*Amount (gms)*
$ZnCl_2$	13.6 (1 mole)
Glycine	15.0 (2 moles)
50.5% NaOH soln.	15.8
Distilled water	55.5

The same procedure was followed in preparing zinc glycinate crystals as in Example 1. One gram of zinc glycinate dissolved in distilled water deodorized 15 ml of titrated fatty acid solution from pH 8.0 to 7.0, below which a mild odour appears. Prior thereto, no odour was evident showing complete deodorization by zinc glycinate.

The addition of 1 gm glycine to 1 gm zinc glycinate in distilled water reduces the solution pH from 8.6 to 7.3. This combination is not as effective as zinc glycinate alone. The mixture deodorizes only 5 ml of fatty acid sweat solution. However, odour reduction is achieved from pH 7.3 to pH 6.5, below which some odour is present. Thus, no deodorizing properties can be attributed to glycine. As a matter of fact, the presence of free glycine reduces the deodorizing capacity of zinc glycinate.

Example 3

Components	*Amount (gms)*
Glycine	52.5
Zinc oxide	20.35
Distilled water	300.0

The above mixture was heated to 200°F (93°C) until a clear solution was obtained. 300 gms of absolute ethanol were added with mixing and a precipitate was formed. The mixture was filtered using #1 Whatman filter paper, and the crystals were washed several times with absolute ethanol. The white crystalline, non-hygroscopic precipitate was placed in a drying pan and air dried at 120°F (49°C)

overnight. The pH of a 1% aqueous solution was 8.3. The pH of a 7% saturated aqueous solution was 8.0. The zinc glycinate had a water solubility of about 6 gm/100 cc water.

A small quantity of a 1% aqueous zinc glycinate was added to synthetic sweat odour solution resulting in complete deodorization.

Example 4

Components	*Amount (gms)*
Glycine	15
Zinc carbonate	12.5
Distilled water	90

The glycine was dissolved in water and the zinc carbonate was added. CO_2 was liberated and the solution was evaporated to dryness to obtain white crystals of zinc glycinate which may be the monohydrate form of zinc glycinate. A 1% aqueous solution had a pH of 7.9. In lieu of evaporation, the solution may be spray dried to obtain the zinc glycinate crystals.

A 5% aqueous solution of the product, deodorizes a solution of artificial sweat.

Deodorant compositions

Example 5
Roll-on deodorant

Part 1 Ingredient	*%*
Deionized water	15.0
Propylene glycol	10.0
Hydroxyethyl cellulose	0.4
Part 2 Ingredient	*%*
SD 40 Ethanol	61.6
Zinc glycinate	10.0
Fumed silica	0.5
Part 3 Ingredient	*%*
Wheat germ glyceride	1.0
Polyoxypropylene stearylether	1.5

The ingredients listed under Part 1 were mixed, and preferably heated to 140°F (60°C) until a thick, uniform dispersion was formed. The ingredients listed under Part 2 were homogenized and added to the thick uniform mixture of Part 1 ingredients with mixing. The ingredients listed under Part 3 were admixed into the Part 1 and 2 mixture and preferably homogenized. A thick, stringy pituitous mixture was obtained which was placed in a conventional roll-on container.

This product was tested by adding 1 g of this roll-on product to 50 ml of a 5% aqueous synthetic human sweat solution. Total effective deodorizing was achieved in-vitro.

In-vivo testing consists in applying this product only to the right armpit, leaving the left armpit as a control. Underarm odour is rated after 24 and 48 hours.

Time	*Control arm*	*Test arm*
24 hrs.	slight odour	no odour
48 hrs.	moderate to heavy odour	no significant odour

Another in-vivo test consists in washing underarms but applying nothing in order to generate moderate odour under both armpits for about 24 hours. This roll-on product is applied to one armpit with almost instant deodorizing action. This product is applied to the second armpit with similar results.

The zinc glycinate product exhibited both odour prevention properties as well as neutralizing existing underarm odours.

No irritation was observed with the product on any occasions.

Aerosol deodorants

	Part 1	*Example 6*	*Example 7*
	Isopropyl palmitate	1.44	2.88
	Bentone 38[1]	0.20	0.40
	Propylene carbonate	0.06	0.12
	Part 2		
	Cyclomethicone	—	4.0
	SD 40 Alcohol	5.0	—
	Zinc glycinate powder	2.0	2.0
	Perfume	0.1	0.1
	Part 3		
	Isobutane	91.2	90.5
		100.0	100.0

[1] Quaternium 18 hectorite

Procedure

The ingredients listed under Part 1 were combined and homogenized under high shear conditions to form a gel.

The part 1 gel was added to and mixed with the SD 40 alcohol or cyclomethicone, and the zinc glycinate powder and perfume were admixed. The slurry was placed in an aerosol container, crimped, and gassed with isobutane.

Both product sprays produce an invisible film on the skin, which afforded almost instant deodorization.

Example 8
Anhydrous deodorant cream

Part 1 *Ingredients*	%
Cyclomethicone	51.0
Isopropyl myristate	3.3882
Bentone 38	0.4706
Propylene carbonate	0.1412
Stearamide MEA (monoethanolamide)	1.5
Zinc stearate	1.5
Polyoxyethylene (20) isohexadecyl ether	2.0
Cocomonoethanolamide	3.0
Part 2	
Zinc glycinate powder	10.0
Part 3	
Dryflo starch (aluminium starch octenyl succinate)	25.0
Part 4	
Colloidal silica	2.0

The ingredients listed under Part 1 were mixed and heated to 225°F (107°C) to form a translucent solution. The mixture was cooled to 180°F (82°C).

The zinc glycinate powder was admixed with Part 1 and the temperature was maintained at 150°F (66°C).

The starch was admixed with Parts 1 and 2 and the temperature was maintained at 150°F (66°C).

The colloidal silica was admixed with combined Parts 1, 2 and 3 while maintaining the temperature at 150°F (66°C).

The final mixture was poured into containers and allowed to cool. The mixture thickened, as it cooled to 100°F (38°C), into a non-pourable soft cream consistency.

The addition of this cream to a synthetic sweat solution effected complete deodorization almost instantaneously.

Known equivalents may be substituted for the specific ingredients in above compositions.

The zinc glycinate, both in the anhydrous form and in the monohydrate form has been found to be a highly effective deodorant in both preventing new odours and neutralizing existing odours, by chemical interaction with the odoriferous components. In addition, the zinc glycinate has been found to inhibit bacterial growth which further enhances its deodorancy properties by preventing bacteria multiplying and produce additional odoriferous components.

Claims

1. A deodorant composition comprising a solution or suspension of a particular deodorant active material which chemically neutralizes odoriferous compounds and inhibits bacterial growth, in a cosmetically acceptable vehicle, characterised in that the said deodorant active material is zinc glycinate.

2. A deodorant composition as claimed in Claim 1 in which the deodorant active material is anhydrous zinc glycinate.

3. A deodorant composition as claimed in Claim 1 in which the deodorant active material is the hydrated form of zinc glycinate.

4. A deodorant composition as claimed in Claim 1, 2 or 3 in which the deodorant active material constitutes about 1—50% by weight of the composition.

5. A deodorant composition as claimed in any one of Claims 1 to 4 which also contains a suspending or thickening agent and is dispensed from a roll-on container.

6. A deodorant composition as claimed in any one of Claims 1 to 4 in which the vehicle is in the form of a lotion comprising a liquid carrier of a lower alcohol or an aqueous alcoholic media.

7. A deodorant composition as claimed in Claim 6 which also contains non-volatile polar or non-polar ingredients selected from the group consisting of polyhydric alcohols and emollient oils.

8. A deodorant composition as claimed in any one of Claims 1 to 4 in which the vehicle is in the form of a stick comprising a monohydric or polyhydric alcohol gelled with a fatty alcohol or fatty amide or combination thereof.

9. A deodorant composition as claimed in any one of Claims 1 to 4 in which the vehicle is in the form of a cream comprising an aqueous emulsion of a fatty material.

10. A deodorant composition as claimed in any one of Claims 1 to 4 in which the zinc glycinate is suspended in a liquid vehicle comprising a carrier liquid and a liquified gaseous propellant, in the form of a deodorant spray.

11. A deodorant as claimed in Claim 1 substantially as specifically described herein with reference to any one of Examples 5 to 8.

12. A method of preparing zinc glycinate which comprises reacting an aqueous solution of glycine with zinc carbonate.

13. A method as claimed in Claim 13 in which the zinc glycinate is recovered in powdered form by evaporation of the solution or spray drying.

14. A method as claimed in Claim 12 substantially as specifically described herein with reference to Example 4.

15. Zinc glycinate whenever prepared by a method as claimed in any one of Claims 12 to 14.

16. A composition as claimed in any one of Claims 1 to 11 in which the zinc glycinate is as claimed in Claim 15.

17. A method of deodorizing odourous body locations comprising contacting said locations with a composition as claimed in any one of Claims 1 to 11 or Claim 16.

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